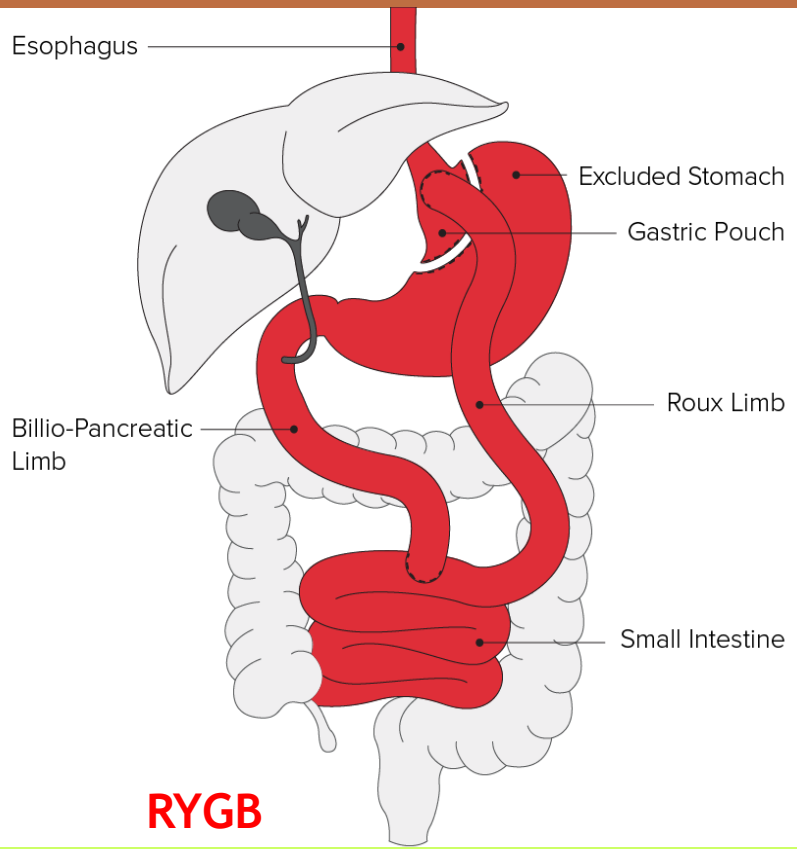
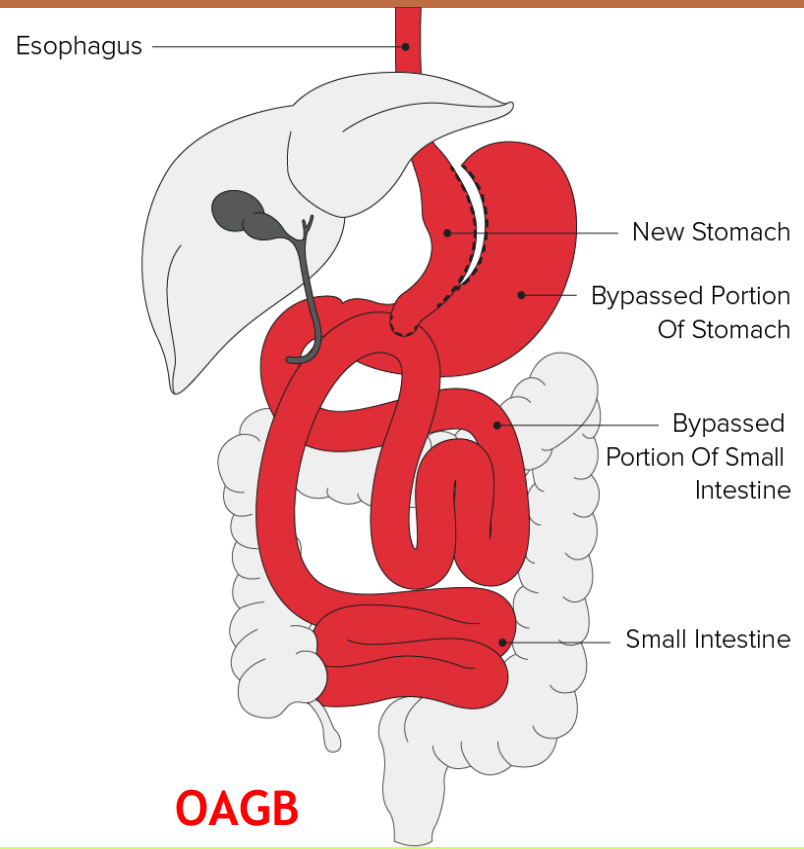
Reversal to normal anatomy, indications, preoperative work-up, technical aspects



RYGB



OAGB

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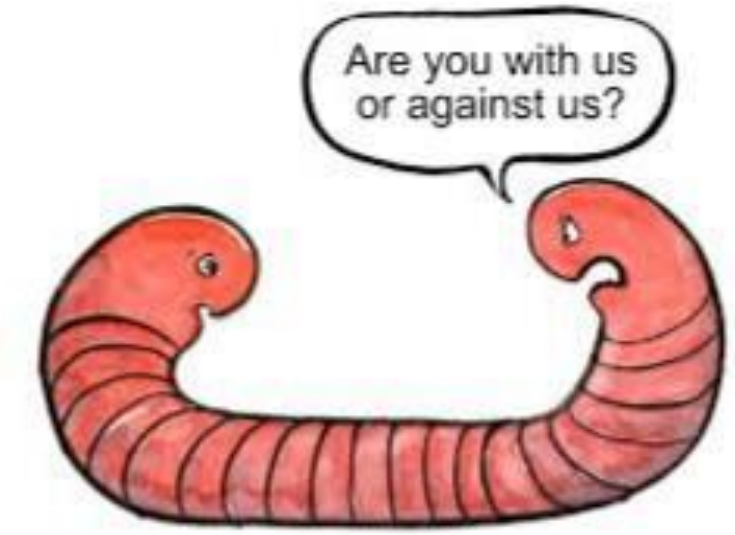
ISMBS Israeli Society for Metabolic & Bariatric Surgery

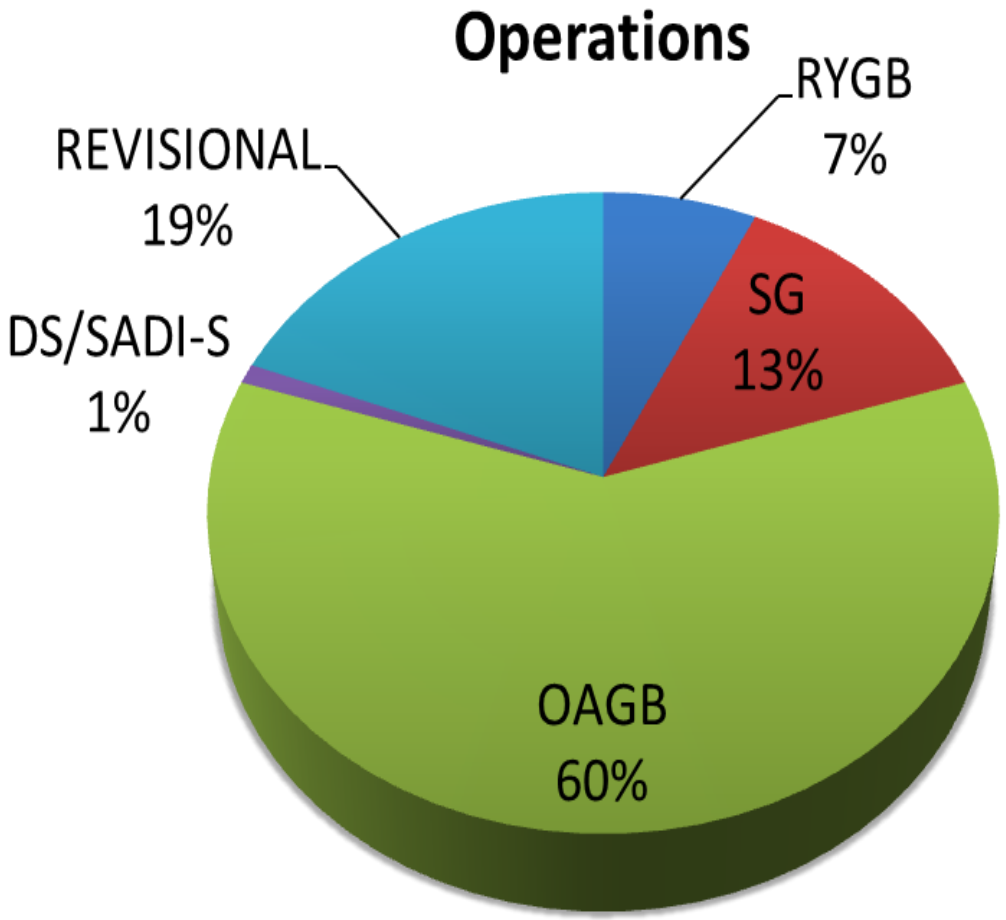
HOLY FAMILY HOSPITAL NAZARETH
PROFESSIONALITÀ OSPITALITÀ PACE

Conflict of Interest Disclosure



I have no actual or potential conflict of interest in relation to this presentation

Case Mix Disclosure Slide



Conversions, Corrective, Reversals
Are we opening a Pandora's box?

- The number of bariatric surgical operations performed worldwide has been steadily **increasing** for the last 10 years
- **Complications** of BS are common
- Due to the large number of **RYGB** and **OAGB** surgeries performed over the last decade, **reversal** of the bypass to normal anatomy has been increasingly reported
- **Himpens** first reported reversal to normal anatomy in 2006

1. https://asmbs.org/resources/estimate-of-bariatric-surgery-numbers (Accessed on May 30, 2019)
2. Encinosa WE, et al. Recent improvements in bariatric surgery outcomes. Med Care. 2009 May;47(5):531-5.
3. Longitudinal Assessment of Bariatric Surgery (LABS) Consortium; Flum DR, et al. Perioperative safety in the longitudinal assessment of bariatric surgery. N Engl J Med. 2009 Jul 30;361(5):445-54.
4. Himpens J, Dapri G, Cadière GB. Laparoscopic conversion of thegastric bypass into a normal anatomy. Obes Surg. 2006;16(7):908– 12.

Reversal to normal anatomy may be necessary in a few recalcitrant patients

- Late complications after **RYGB** and **OAGB** such as:
  - Malnutrition
  - Micronutrient deficiency
  - Excessive weight loss
  - Marginal ulcers
- Non-surgical treatment usually includes:
  - Dietary regulation
  - Psychological assessment
  - Medical treatment

Reversal operations are associated with high complication rates and long operative times

- Published series report long mean **operative times** ranging from 120 to 170 min

- **High rates of complications** – such as leaks (30%), bleeding (30%), among others – as well as high postsurgical morbidity

*Park JY, Kim YJ. Successful laparoscopic reversal of gastric bypass in a patient with malnutrition. Ann Surg Treat Res. 2014;87(4): 217–21.
*Ma P, Reddy S, Lloyd A, et al. Reversal of roux-en-Y gastric bypass at a large tertiary center with a large experience in laparoscopic gastric bypass revision: Indications and outcomes. Surg Obes Relat Dis. 2016;12:S56–75. A5010, Posters of distinction
*Vilallonga R, van deVrande S, Himpens J. Laparoscopic reversal of Roux-en-Y gastric bypass into normal anatomy with or without sleeve gastrectomy. Surg Endosc. 2013;27(12):4640–8.
*Nergaard BJ, Leifsson BG, Hedenbro J, et al. Gastric bypass with long alimentary limb or long pancreato-biliary limb–long-term results on weight loss, resolution of co-morbidities and metabolic parameters. Obes Surg. 2014;24(10):1595–602.
*Arman GA, Himpens J, Bolckmans R, et al. Medium-Term Outcomes after Reversal of Roux-en-Y Gastric Bypass. Obes Surg. 2018;28(3):781–90.
*Pernar LI, Kim JJ, Shikora SA. Gastric bypass reversal: a 7-year experience. Surg Obes Relat Dis. 2016;12(8):1492–8.
*Arman GA, Himpens J, Bolckmans R, et al. Medium-Term Outcomes after Reversal of Roux-en-Y Gastric Bypass. Obes Surg. 2018;28(3):781–90.
*Ambrecht U, Lundell L, Lindstedt G, et al. Causes of malabsorption after total gastrectomy with Roux-en-Y reconstruction. Acta Chir Scand. 1988;154(1):37–41.
*Higa KD, Boone KB, Ho T. Complications of the laparoscopic Rouxen-Y gastric bypass: 1040 patients—what have we learned? Obes Surg. 2000;10(6):509–13.

Indications for reversal surgery

- Metabolic complications (59%):
  - Severe dumping syndrome, postprandial hypoglycemia
  - neuroglycopenia
  - Hypocalcemia
- Physical complications (26%):
  - recurrent anastomotic ulcer
- Nutritional complications (18%):
  - Severe malnutrition
  - Cachexia
- Other complications (9%):
  - excessive weight loss
  - intractable nausea and vomiting
  - chronic abdominal pain

Postoperative morbidity rate (42%):

- Weight regain
- Gastroesophageal reflux
- Persistent abdominal pain
- Chronic diarrhea

1. GASTROINTESTINAL ENDOSCOPY Volume 82, No. 4 : 2015
2. Reversal of Roux-en-Y Gastric Bypass / Surgery for Obesity and Related Diseases 11 (2015) 821–827
3. S. Shoar et al. / Surgery for Obesity and Related Diseases 12 (2016) 1366–1372
4. R. C. Moon et al. / Surgery for Obesity and Related Diseases 11 (2015) 821–827
5. P. H. Pucher et al. / Surgery for Obesity and Related Diseases 12 (2016) 1351–1356

Pooled estimation of the meta-analysis reported a prevalence of 1% for reversal

Special attention should be paid to malnutrition in all OAGB patients during FU

Indication for reversal surgery:

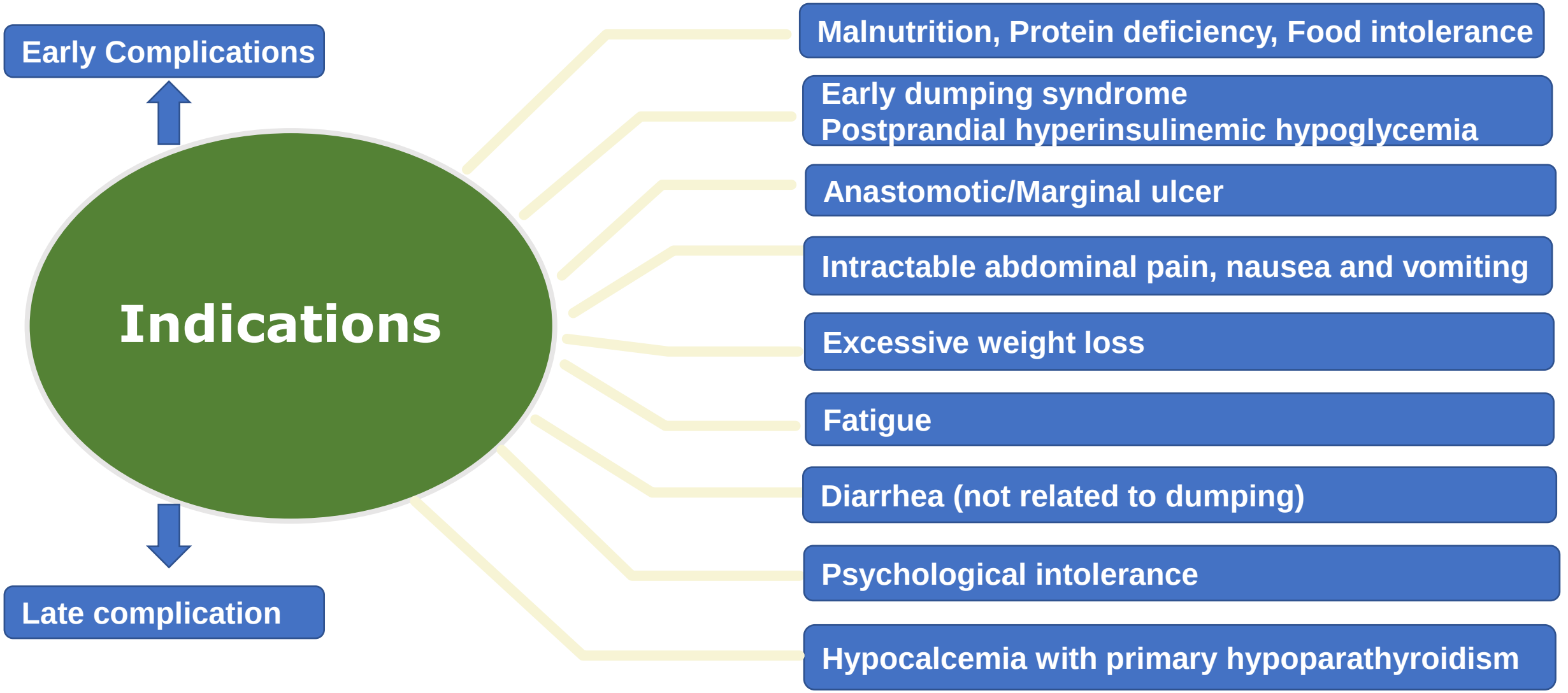
- 21.4% of nutritional adverse events (200cm BPLL).
- Iron deficiency (3.9%–12.7%)
- Vitamin D deficiency (32%)
- Hypoglycemia
- Hypoalbuminemia
- Anastomotic ulcers (6-8%)
- Biliary reflux (.9%–1.6%)
- Severe diarrhea
- Excess weight loss (1-1.3%)
- Deranged liver function

Complications after reversal (10.9%):

- Bleeding
- Leakage
- intestinal obstruction
- stenosis
- death due to severe liver failure

1. Mohammad Kermansaravi et al. / Surgery for Obesity and Related Diseases 17 (2021) 1489–1496
2. Langenbecks Arch Surg (2017) 402:1263–1270

Indications for Reversal after RYGB and OAGB



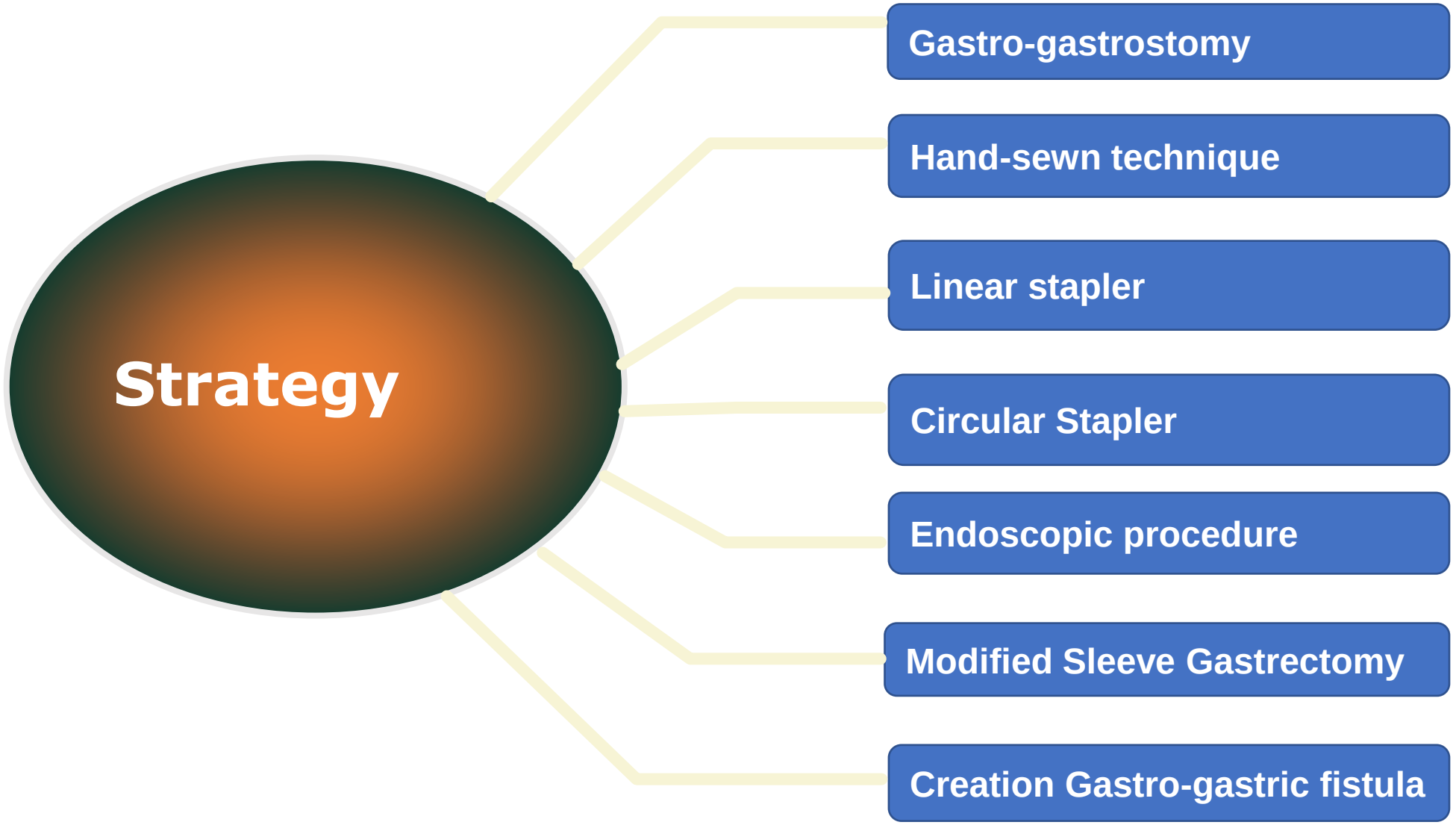
A strong evaluation and treatment plan can make patients more successful in the short- and long-term after revisional surgery

- Clinical history, and physical examination
- An evaluation by a registered dietitian
- A psychosocial-behavioral evaluation
- Preoperative Endoscopic and Radiologic Evaluation (**UGI Test, CT, US**)
- A copy of the primary surgery team's **operative report** should be obtained and reviewed
- Cardiac and pulmonary assessments
- Admission for a set period of time with **TPN**
- Usage of PEG

Reversal of **RYGB** or **OAGB** is a challenging task, and several techniques of laparoscopic reversal have been published so far, among these are the following:

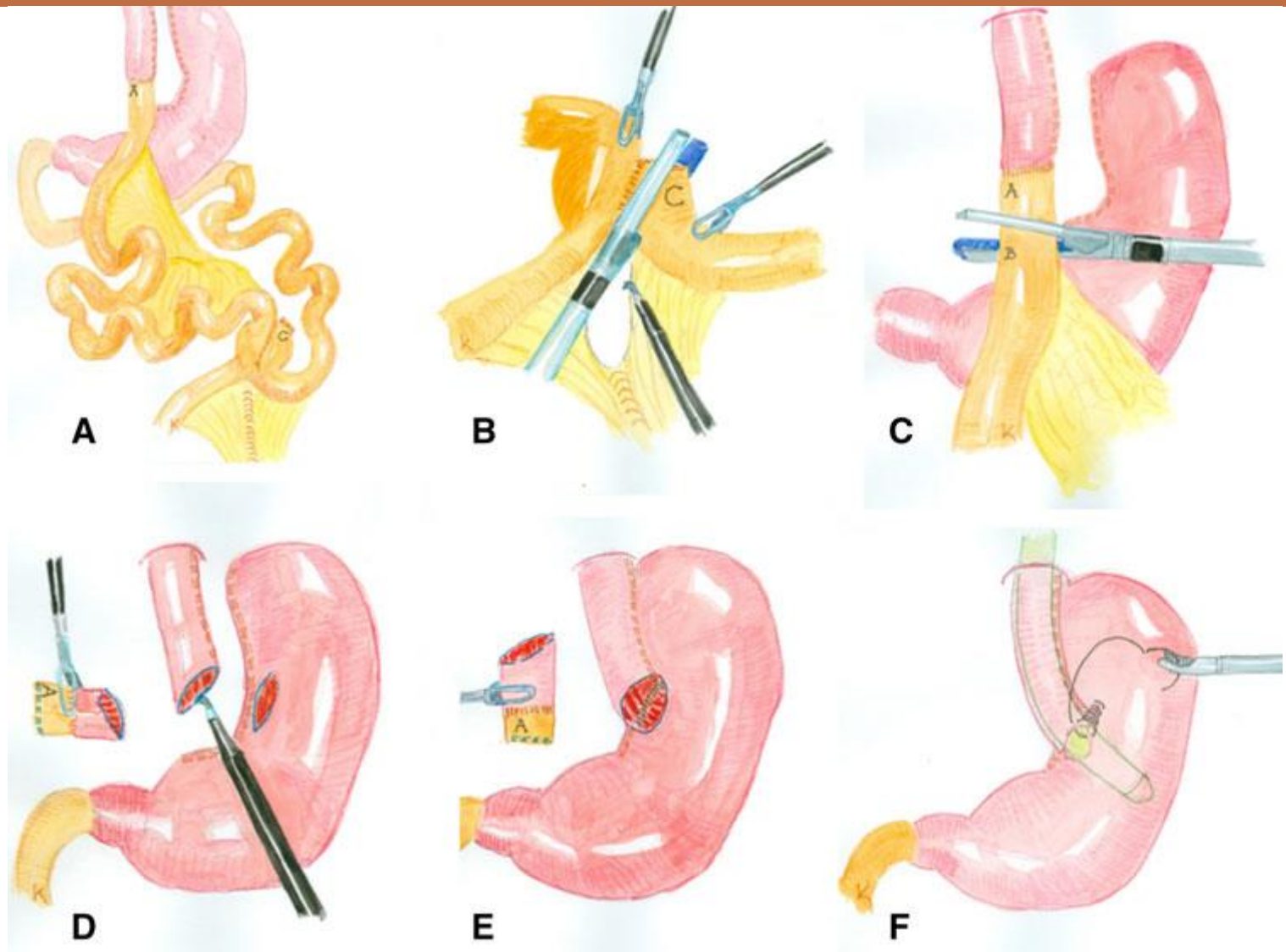
- Reattachment of the gastric pouch to the remnant stomach and the subsequent resection of the roux-limb (RL)
- Resection of Roux-limb except for 15–20 cm
- Stapling of proximal end of RL to a long blind end (70 cm) of the biliopancreatic limb (BPL) without dismantling the old jejuno-jejunostomy
- Transection of the BPL off the jejuno-jejunostomy and attachment to the proximal end of the RL
- Partial reversal with division of the RL 6 cm below the gastric pouch and subsequent anastomosis to the gastric remnant and dismantling of previous entero-entero-anastomosis and anastomosing the proximal end of former RL and distal end of BPL

Strategy for Reversal after RYGB and OAGB



Technical Considerations: RYGB Reversal

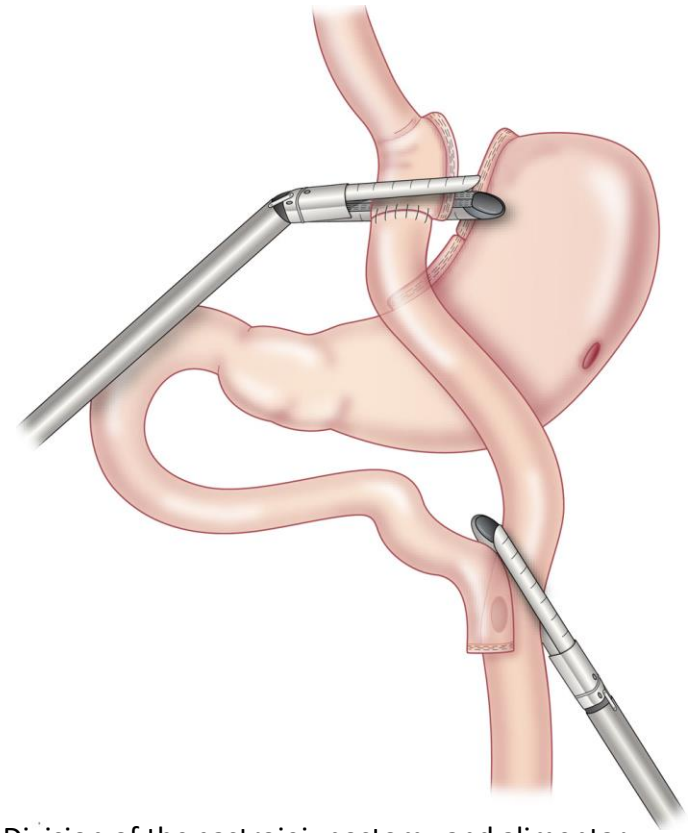
Normal anatomy after Gastric Bypass



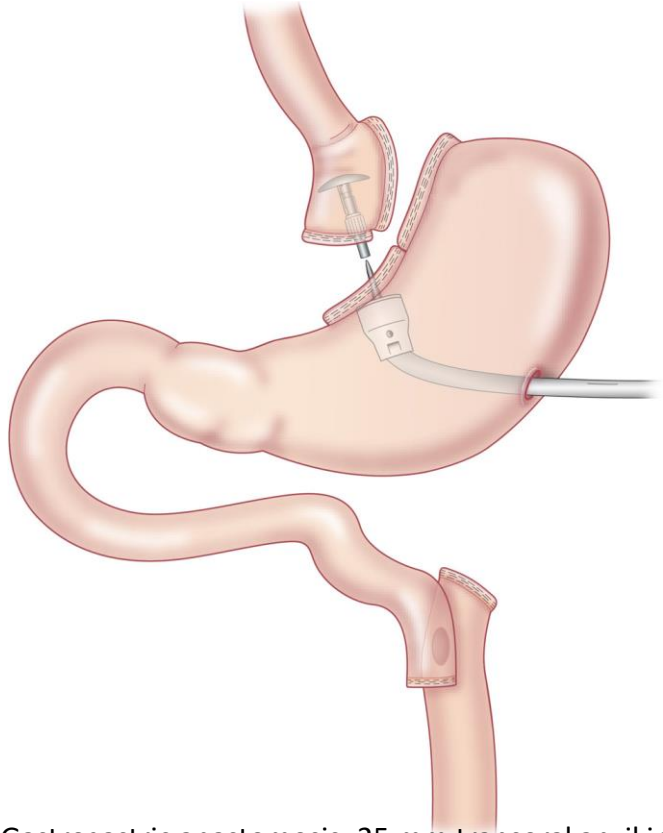
Vilallonga R, van de Vrande S, Himpens J. Laparoscopic reversal of Roux-en-Y gastric bypass into normal anatomy with or without sleeve gastrectomy. Surg Endosc. 2013 Dec;27(12):4640-8.

Technical Considerations: RYGB Reversal

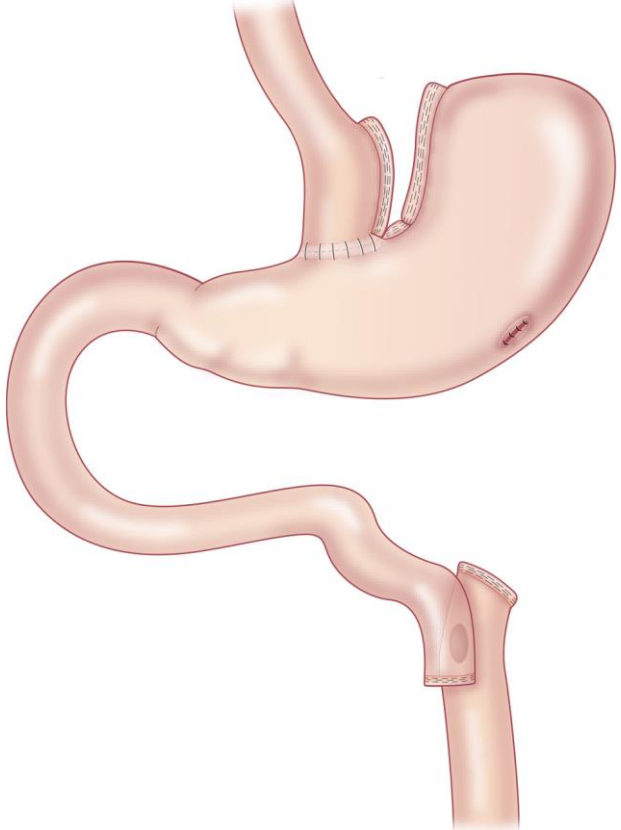
Reattachment of the gastric pouch to the remnant stomach and the subsequent resection of the RL



Division of the gastrojejunostomy and alimentary limb just above the jejuno-jejunostomy using linear staplers



Gastrogastric anastomosis: 25 mm transoral anvil in the gastric pouch being connected to the 4.8 mm, 25 mm circular stapler inserted in the excluded stomach

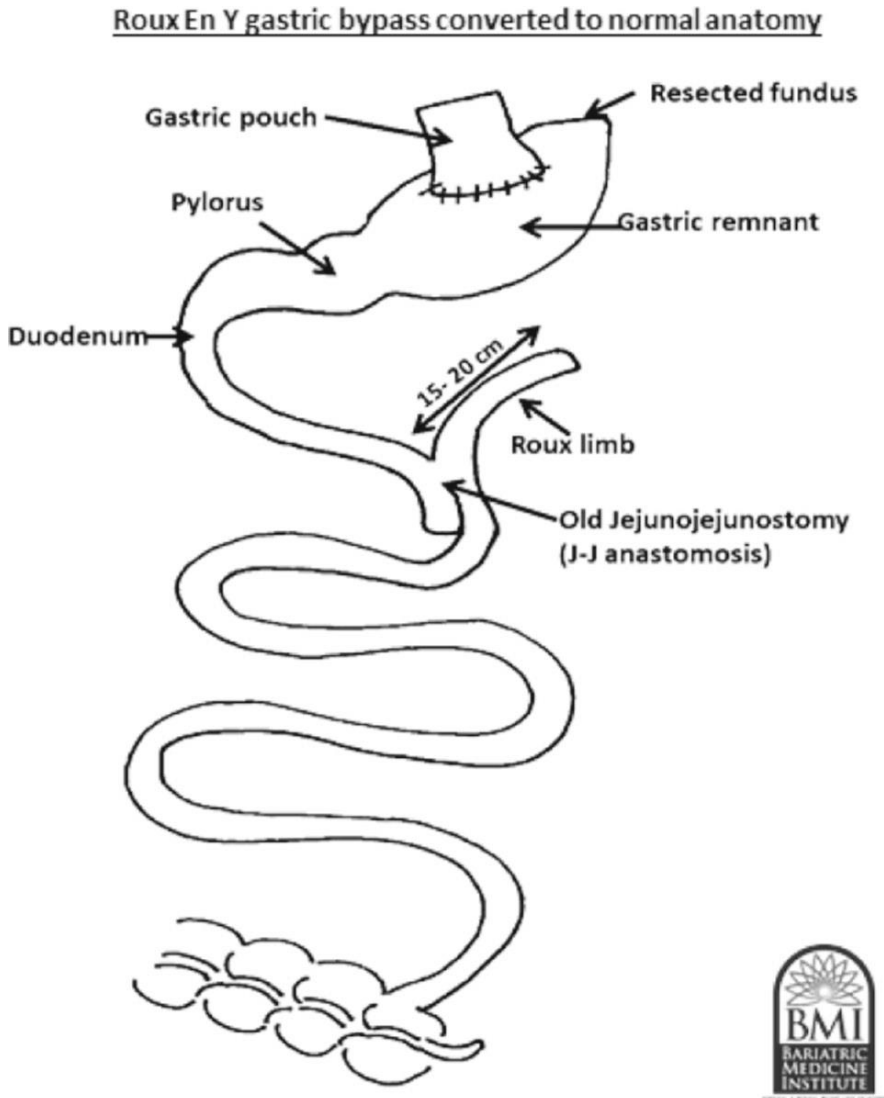


Final aspect—laparoscopic reversal to normal anatomy.

Campos GM, Ziemelis M, Paparodis R, Ahmed M, Davis DB. Laparoscopic reversal of Roux-en-Y gastric bypass: technique and utility for treatment of endocrine complications. Surg Obes Relat Dis. 2014 Jan-Feb;10(1):36-43.

Technical Considerations: RYGB Reversal

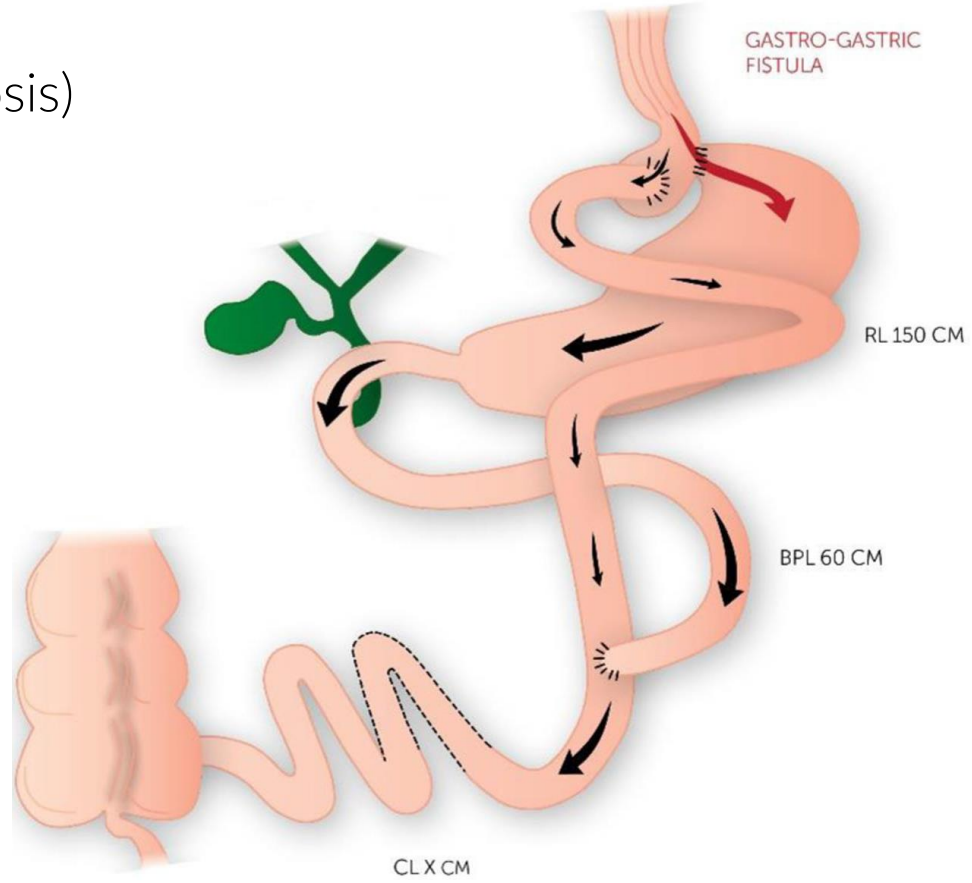
Resection of Roux-limb except for 15–20 cm



Zaveri H, Dallal RM, Cottam D, et al. Indications and Operative Outcomes of Gastric Bypass Reversal. Obes Surg. 2016 Oct;26(10):2285-90.

Technical Considerations: RYGB Reversal

A 3 cm gastro-gastric fistula (anastomosis)



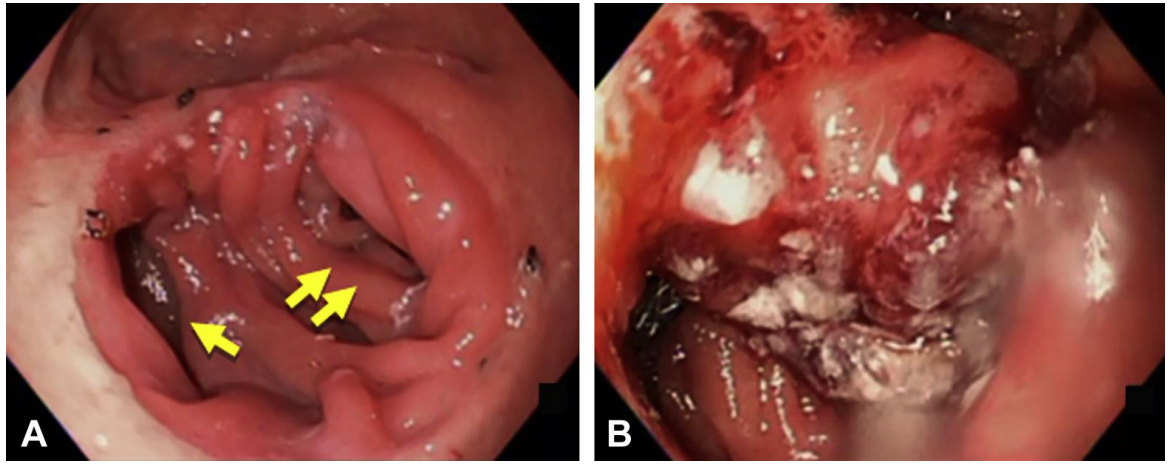
Hand suturing

Linear stapler

Shah K, Gislason H. Roux-en-Y Gastric Bypass Reversal: A Novel Technique With Functional Reversal - Case Series. Obes Surg. 2020 Apr;30(4):1589-1595.

Endoscopic Reversal of RYGB to normal anatomy

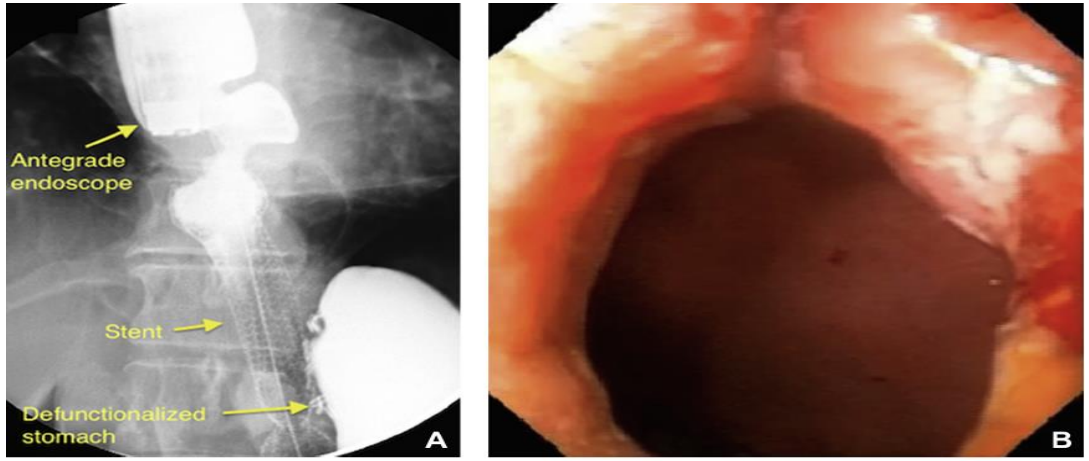
Before and after endoscopic reversal of RYGB.



- A: Before procedure, blind portion of Roux limb (single arrow) and proximal efferent Roux limb (double arrows) are visualized.
- B: After procedure, the blind portion of the Roux limb contains a transluminal stent, and the proximal efferent Roux limb is sutured closed

GASTROINTESTINAL ENDOSCOPY Volume 82, No. 4 : 2015
GASTROINTESTINAL ENDOSCOPY Volume 82, No. 6 : 2015

Endoscopic fistulization and stent bridge of the functional and defunctionalized stomach.

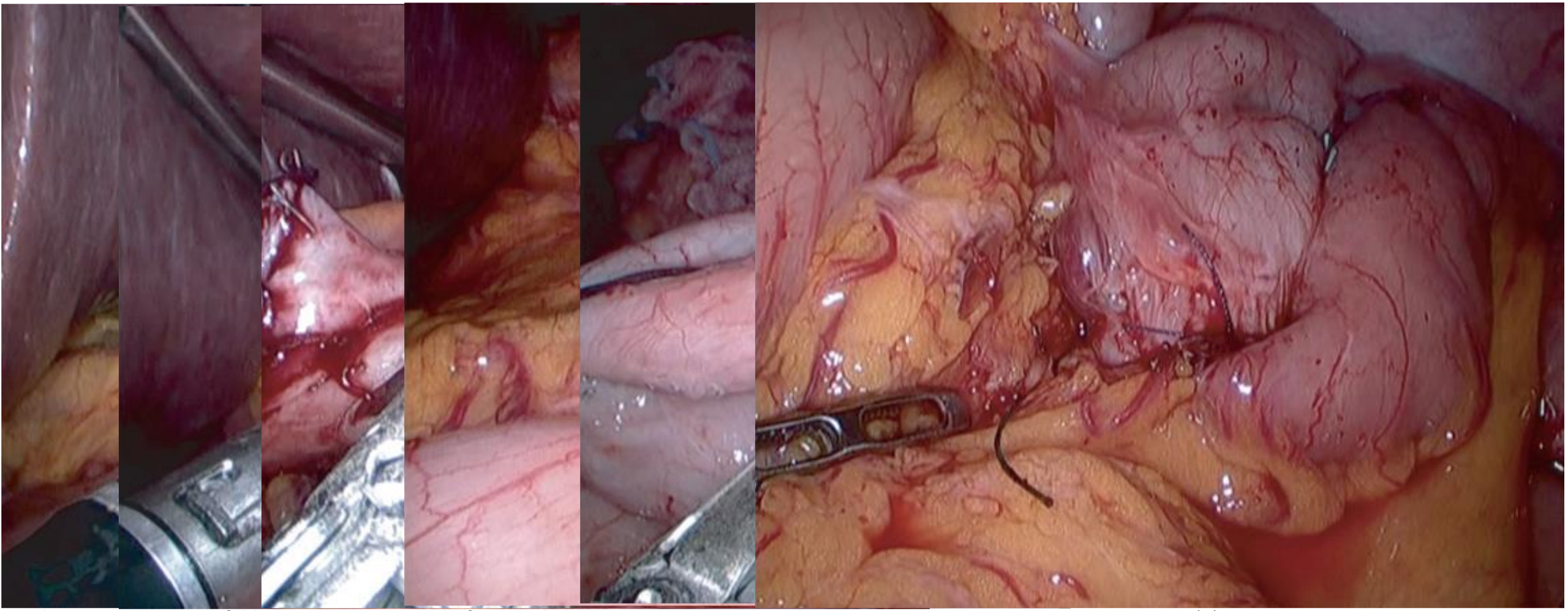


- A: Bridging stent placed across gastro-gastric fistula; contrast medium injected from the distal esophagus passing through the stent and entering the defunctionalized stomach.
- B: Endoscopic view of patent Gastro-gastric fistula after stent removal.

Ngamruengphong S, et al. Endoscopic reversal of gastric bypass for severe malnutrition after Roux-en-Y gastric bypass surgery. Gastrointest Endosc. 2015 Oct;82(4):746.

Technical Considerations: RYGB Reversal

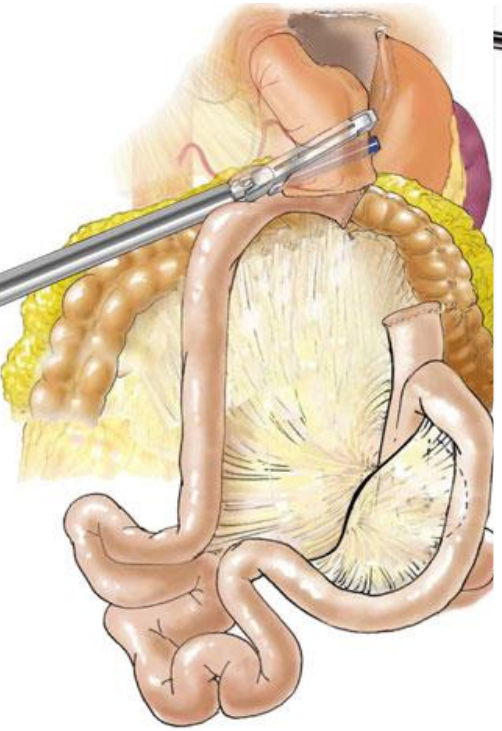
Stapling of proximal end of RL to a long blind end (70 cm) of the BPL without dismantling the old JJ



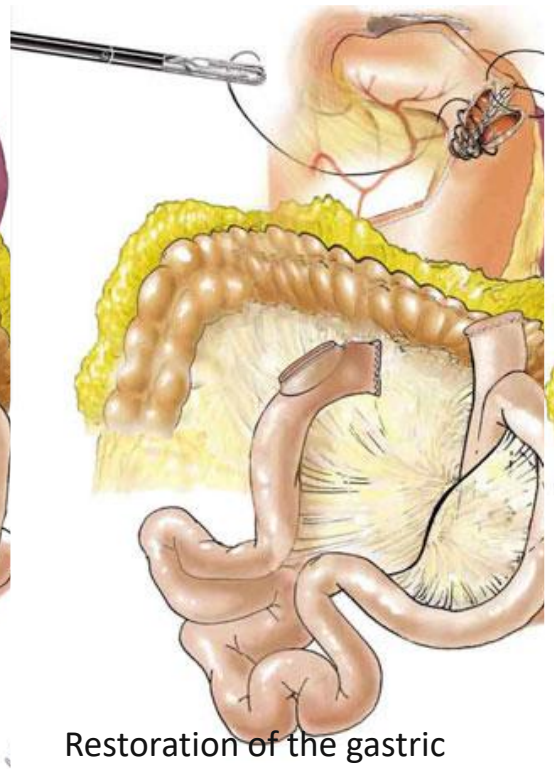
Park JY, Kim YJ. Successful laparoscopic reversal of gastric bypass in a patient with malnutrition. Ann Surg Treat Res. 2014 Oct;87(4):217-21.

Technical Considerations: RYGB Reversal

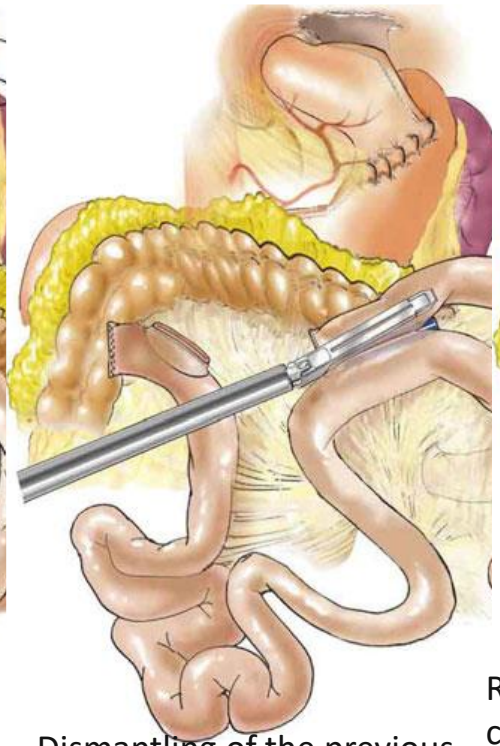
Transection of the BPL off the jejuno-jejunostomy and attachment to the proximal end of the RL



Dismantling of the previous GJS on the gastric site

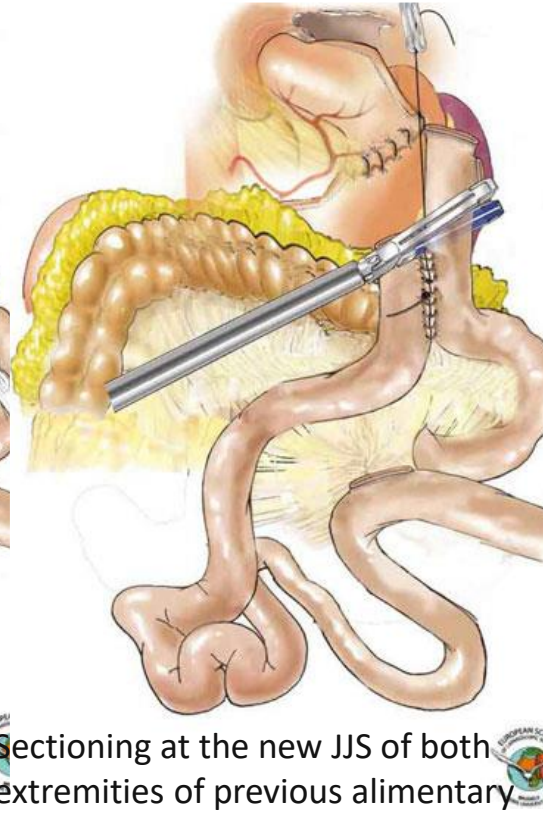


Restoration of the gastric continuity through a manual GGS between the gastric pouch and the gastric remnant



Dismantling of the previous JJS (more on the biliary limb)

Restoration of the SB continuity through a new JJS, performed between the previous alimentary proximal end, and the previous biliary distal end



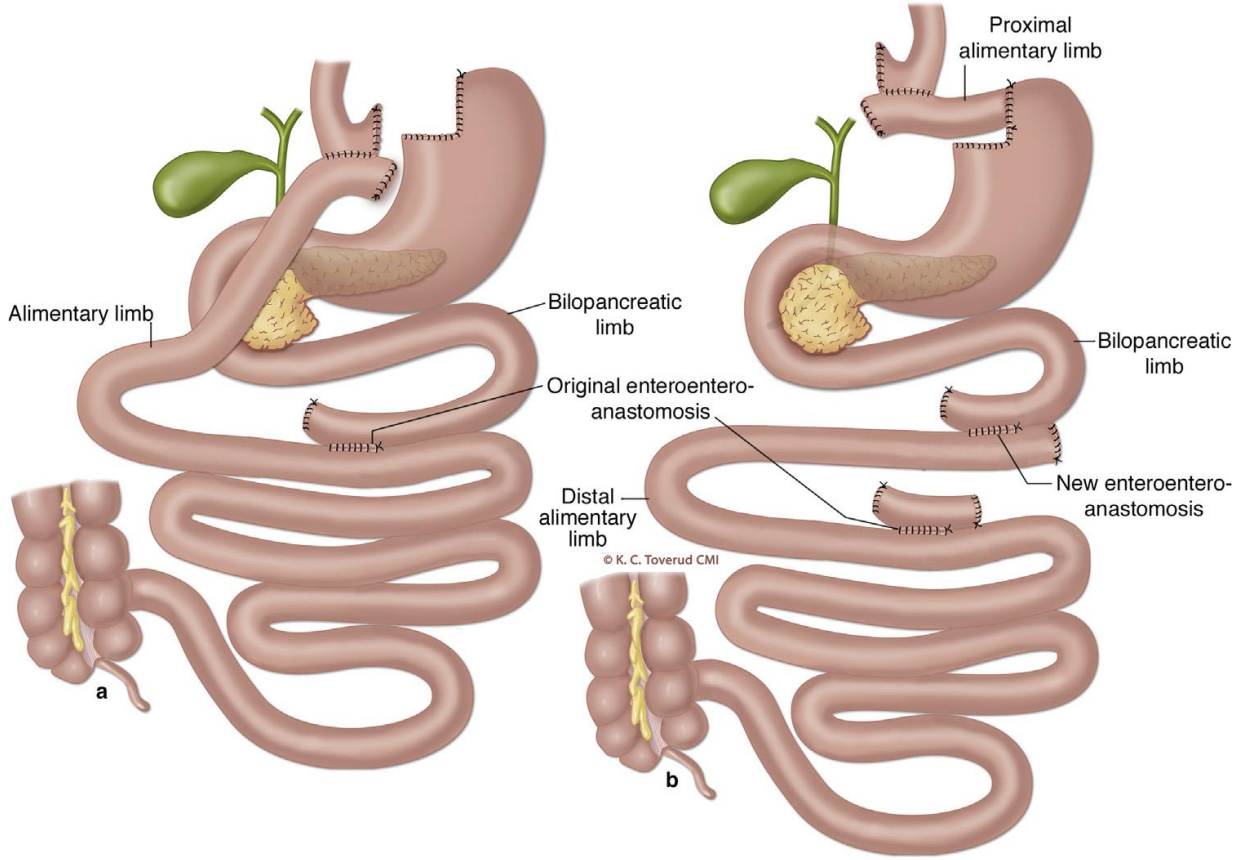
Sectioning at the new JJS of both extremities of previous alimentary proximal end, and previous biliary distal end

Dapri G, Cadière GB, Himpens J. Laparoscopic reconversion of Roux-en-Y gastric bypass to original anatomy: technique and preliminary outcomes. Obes Surg. 2011 Aug;21(8):1289-95.

Technical Considerations: RYGB Reversal

Partial reversal with division of the RL 6 cm below the gastric pouch and subsequent anastomosis to the gastric remnant and dismantling of previous entero-entero anastomosis and anastomosing the proximal end of former RL and distal end of BPL

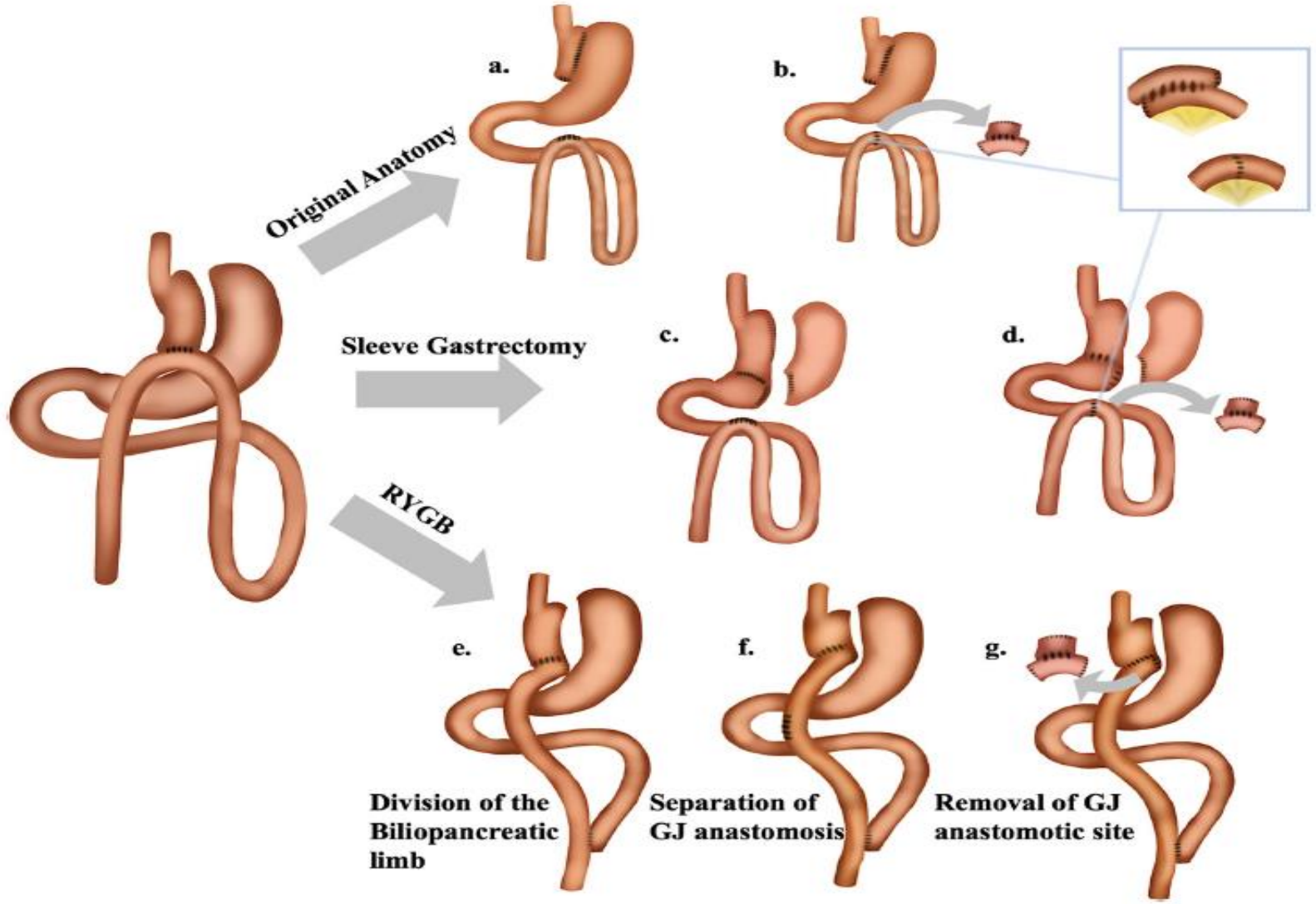
The entero–entero anastomosis (OEE) and the gastro–jejunostomy after RYGB



The division of the alimentary limb 6 cm below the GJS and the anastomosis of the proximal part of the alimentary limb to the gastric remnant.
A new entero–entero anastomosis is made between the former alimentary and BPL following transection of the original entero–entero anastomosis at the BPL side.

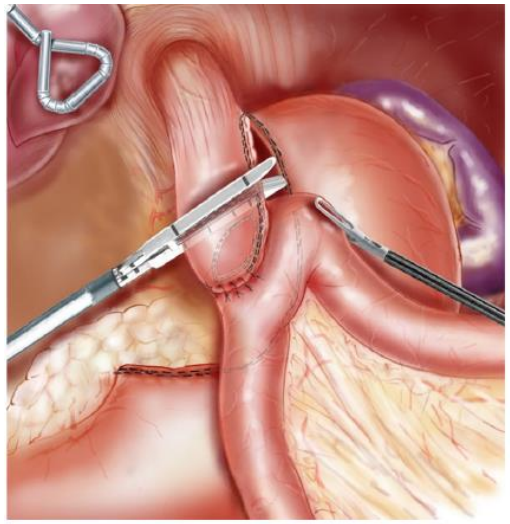
Qvigstad E, Gulseth HL, Risstad H, et al. A novel technique of Roux-en-Y gastric bypass reversal for postprandial hyperinsulinemic hypoglycaemia: A case report. Int J Surg Case Rep. 2016;21:91-4.

Technical Considerations: OAGB Reversal

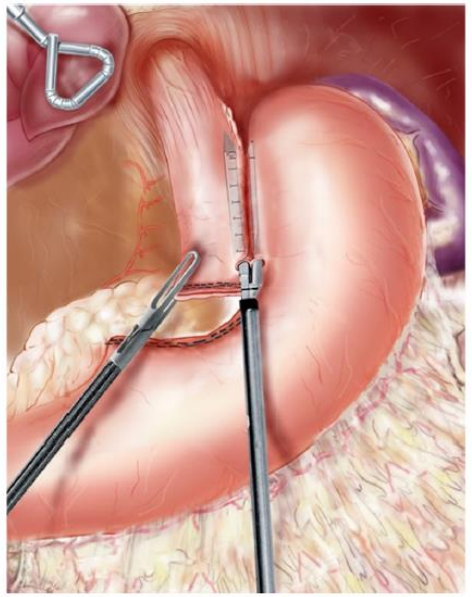


Khrucharoen U, Juo YY, Chen Y, Dutson EP. Indications, Operative Techniques, and Outcomes for Revisional Operation Following Mini-Gastric Bypass-One Anastomosis Gastric Bypass: a Systematic Review. Obes Surg. 2020 Apr;30(4):1564-1573.

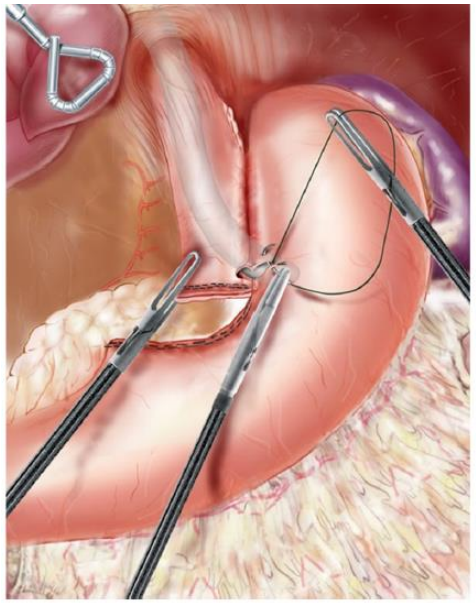
Technical Considerations: OAGB Reversal



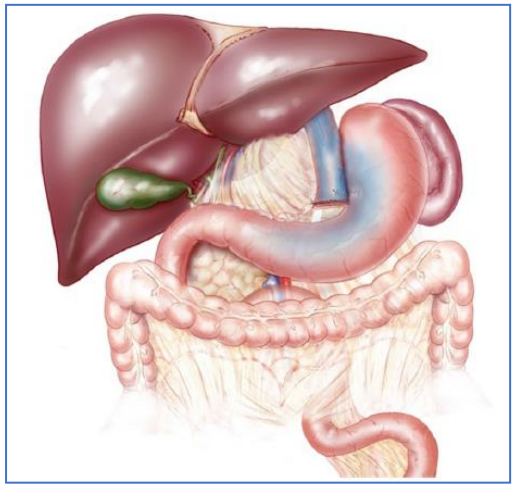
1.Dismantling of the previous gastrojejunostomy



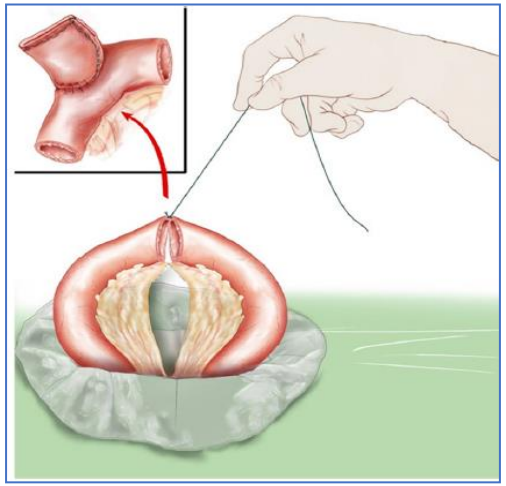
2.Restoration of the gastric continuity through a vertical linear stapled gastro-gastrostomy between the gastric pouch and the gastric remnant



3.Manual closure of the anterior defect of the gastro-gastrostomy



4.Resection of the jejunal segment corresponding to the previous gastrojejunostomy and restoration of the small bowel continuity through a new manual end-to-end jejunojejunostomy



5.Intraoperative methylene-blue-dye-test

Genser L, et al. Laparoscopic reversal of mini-gastric bypass to original anatomy for severe postoperative malnutrition. Langenbecks Arch Surg. 2017 Dec;402(8):1263-1270.

Conclusions: RYGB Reversal

- Reversal of RYGB is a complex revisional operation that can be safely performed in a select group of patients with serious complications
- Surgical therapy allows for quality of life improvement and decreases the incidence of severe long-term complications
- The main indications for reversal of RYGB included malnutrition with and without MUs
- Reversal to normal anatomy carries high morbidity (sepsis, leaks and bleeding, high reoperation, and readmission rates).
- Reversal of RYGB has a role in the treatment of a select group of patients, it should be undertaken by surgeons with considerable experience in RYGB revision
- The average time from primary gastric bypass to reversal is approximately 9 years, and postoperative follow-up remains challenging

Conclusions: OAGB Reversal

- OAGB reversal has a prevalence of 1% and a complication rate of 10.9% and was performed on average 23.6 months after the primary OAGB surgery
- Protein-energy malnutrition with hypoalbuminemia and its clinical manifestations was the leading etiology of reversal in all OAGB patients during follow-up
- The mean BPL and CC lengths were 215 cm and 380 cm, respectively, in the reported cases
- Weight gain and improvement in nutrition are seen soon after reversal
- long-term data are limited with low follow-up rates
- Postoperative complications are higher than primary gastric bypass with acceptable risks and low mortality

Reversal surgery are here to stay

- Reversal procedures may be an effective procedure to treat chronic complications of RYGB and OAGB
- However, it is accompanied by a risk of postoperative complications and may incur additional chronic morbidity for the patient
- Reversal of RYGB to normal anatomy is reasonable in patients with severe or refractory complications
- Weight gain and improvement in nutrition are seen soon after reversal
- Reversal of gastric bypass should be performed by surgeons with technical competence and resources available to manage perioperative complications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